



Making a Comet

Grade Level: All

Objectives:

- Understanding of composition of comets and their life cycles

Arizona State Standards:

- **1SC-P2.** Compare observations of real world to observations of a constructed model. **PO 1.** Assess the capability of a model to represent a “real-world” scenario.



Time Needed: 1 class period

This demo is good to demonstrate the composition of a comet as well as what happens to a comet as it approaches the sun.

Background:

Start by explaining what comets are and their structure. Begin the demo. During preparation of the comet explain the origin of comets and their place in the solar system. **Long-period comets** reside in the **Oort Cloud** and **short period comets** reside in the **Kuiper belt**. The Oort Cloud is located at the edge of our solar system, about 50,000 AU from the sun and the Kuiper belt is located between the orbits of Uranus and Pluto. Short period comets have orbits less than 200 years and long period comets can have orbits as large as 30 million years. Comets are made of volatiles, rocky material, and dust. The head of a comet is called the **nucleus** and the tail is called the **coma**. The tail enlarges as the comet approaches the sun. There may also be a second tail, the **ion tail**, which consists of charged particles that interact with the solar wind. A comets tail always points away from the sun in the direction of the **solar wind**. Comets may help to unravel the history of the solar system because they are remnants of early solar system formation, in other words they are very old and unchanged. NASA currently has a mission called *Stardust*, which will fly by comet Wild-2 and collect dust to be returned to Earth. A 2004 launch is scheduled for Project *Deep Impact* where a crater will be created in Comet Tempel-1 to help explore the origins of the solar system.

Materials:

2 cups water
2 cups dry ice
2 spoonfuls of sand or dirt and brown sugar (provided)
Teaspoon of molasses or dark corn syrup (provided)
Dash of ammonia (provided)
Ice chest (provided)
Large mixing bowl (provided)

Medium size garbage bags (provided)
Rubber gloves (provided)
Hammer, meat pounder, or rubber mallet (provided)
Large mixing spoon (provided)
Paper towels (provided)

Procedure:

1. Line mixing bowl with garbage bag
2. Add water, sand, molasses, and a dash of ammonia (about 1tsp), stir well
3. Put on rubber gloves
4. Place dry ice inside 3 layered garbage bags
5. Crush dry ice into a powder, no lumps
6. Add dry ice to the rest of the mixture while stirring well
7. Continue to stir and add dry ice until mixture becomes slushy
8. Gather garbage bag in mixing bowl around the mixture and shape it as you would a snowball
9. Unwrap the comet from the garbage bag and display for all to see

Comments:

- Comet should not be touched without gloves
- Dry ice will cause a fog that can represent the tail and the sublimation of CO_2
- Water represents water ice
- Dirt and brown sugar represent rocky materials and metals
- Ammonia (NH_3) is the source of nitrogen and hydrogen volatiles. When added to the mixture this will cause bubbling which represents the boiling off of volatiles as the comet nears the sun.

Vocabulary:

Short and long period comets, Oort Cloud, Kuiper belt, coma, nucleus, ion tail, solar wind

Reference:

<http://www.solarviews.com/eng/edu/comets.htm>

Additional Resources:

- <http://universalguide.com/space/space-cometsasteroids.htm>
- http://encke.jpl.nasa.gov/whats_visible.html
- <http://www.seds.org/nineplanets/nineplanets/comets.html>
- <http://nssdc.gsfc.nasa.gov/planetary/planets/asteroidpage.html>
- <http://www.solarviews.com/eng/comet.htm>
- <http://www.pbs.org/wgbh/nova/spacewatch/make-a-comet.html>